CLAIMS

I CLAIM:

1. An asymmetrically patterned magnetic device comprising:

at least one ferromagnetic data layer of a first size, the data layer characterized by an alterable orientation of magnetization;

an intermediate layer in contact with the data layer; and

at least one ferromagnetic reference layer of a second size, the reference layer characterized by a reference magnetic field, the reference layer in contact with the intermediate layer, opposite from and asymmetric to the data layer.

2. The asymmetric magnetic device of claim 1, wherein the magnetic device is a magnetic field sensor.

3. The asymmetric magnetic device of claim 1, wherein the magnetic device is a magnetic memory cell.

4. The asymmetric magnetic device of claim 1, wherein the data layer is further characterized as having a first end, a second end, and a length along a longitudinal axis therebetween, the alterable magnetization having a North pole and a South pole aligning to each end of the data layer; and

the reference layer is characterized as having a first end, a second end, and a length along a longitudinal axis therebetween, the reference magnetic field having a North pole and a South pole aligning to each end of the reference layer, and the length of the data layer being different from the length of the reference layer.

5. The asymmetric magnetic device of claim 4, wherein the interaction between the poles of the data layer and the poles of the reference layer may be characterized as one-end involvement.

6. An asymmetrically patterned magnetic memory storage device comprising:

at least one magnetic memory cell, each cell characterized by:

at least one ferromagnetic data layer of a first size, the data layer characterized by an alterable orientation of magnetization;

an intermediate layer in contact with the data layer; and

at least one ferromagnetic reference layer of a second size, the reference layer characterized by a reference magnetic field, the reference layer in contact with the intermediate layer, opposite from and asymmetric to the data layer.

7. The asymmetric magnetic memory of claim 6, wherein the data layer is smaller than the reference layer.

8. The asymmetric magnetic memory of claim 6, wherein the data layer is further characterized as having a first end, a second end, and a length along a longitudinal axis therebetween, the alterable magnetization having a North pole and a South pole aligning to each end of the data layer; and

the reference layer is characterized as having a first end, a second end, and a length along a longitudinal axis therebetween, the reference magnetic field having a North pole and a South pole aligning to each end of the reference layer, and the length of the data layer being different from the length of the reference layer.

9. The asymmetric magnetic memory of claim 8, wherein the first end of the data layer is substantially vertically aligned with the first end of the reference layer.

10. The magnetic memory of claim 9, wherein the interaction between the poles of the data layer and the poles of the reference layer may be characterized as one-end involvement.

11. The asymmetric magnetic memory of claim 9, wherein during a write operation to change the alignment of the data layer magnetic field to parallel the reference layer magnetic field, a magnetic field is applied to overcome the coercitivity of the data layer, the magnetic field sufficient to align the data layer North pole at the data layer first end with the reference layer North pole at the reference layer first end.

12. The asymmetric magnetic memory of claim 8, wherein the magnetic field of the data layer is substantially symmetric about the longitudinal axis.

13. The asymmetric magnetic memory of claim 12, wherein the data layer is a substantially planar parallelogram with right angles.

14. The asymmetric magnetic memory of claim 6, further comprising:

a plurality of parallel electrically conductive rows; and

a plurality of parallel electrically conductive columns transverse to the rows, the columns and rows thereby forming a cross point array with a plurality of intersections;

wherein each memory cell is located at an intersection between a row and a column.

15. The magnetic memory of claim 6, wherein the reference layer is characterized by a pinned orientation of magnetization.

16. The asymmetric magnetic memory of claim 6, wherein the reference layer is a soft reference layer, the layer having a non-pinned orientation of magnetization.

17. The asymmetric magnetic memory of claim 6, wherein the intermediate layer is a tunnel layer.

18. An asymmetrically patterned magnetic memory storage device comprising:

at least one magnetic memory cell, each cell characterized by:

at least one ferromagnetic data layer of a first size having a first end, a second end and a length along a longitudinal axis therebetween, and further characterized by an alterable orientation of magnetization along the longitudinal axis, the alterable magnetization having a North pole and a South pole aligning to each end of the data layer;

an intermediate layer in contact with the data layer; and

a ferromagnetic reference layer of a second size in contact with the intermediate layer, opposite from and asymmetric to the data layer, the reference layer having a first end, a second end, and a length along a longitudinal axis therebetween, and further characterized by a reference magnetic field along the longitudinal axis, the reference magnetic field having a North pole and a South pole aligning to each end of the reference layer.

19. The asymmetric magnetic memory of claim 18, wherein the magnetic field of the data layer is substantially symmetric about the longitudinal axis.

20. The asymmetric magnetic memory of claim 19, wherein the data layer is a substantially planar parallelogram with right angles.

21. The asymmetric magnetic memory of claim 18, wherein the data layer is smaller than the reference layer.

22. The asymmetric magnetic memory of claim 18, wherein the interaction between the poles of the data layer and the poles of the reference layer may be characterized as one-end involvement.

23. The asymmetric magnetic memory of claim 21, wherein the first end of the data layer is substantially vertically aligned with the first end of the reference layer.

24. The asymmetric magnetic memory of claim 22, wherein during a write operation to change the alignment of the data layer magnetic field to parallel the reference layer magnetic field, a magnetic field is applied to overcome the coercitivity of the data layer, the magnetic field sufficient to align the data layer North pole at the data layer first end with the reference layer North pole at the reference layer first end.

25. The asymmetric magnetic memory of claim 19, wherein the first end of the data layer is flush with the first end of the reference layer.

26. The asymmetric magnetic memory of claim 19, wherein the first end of the data layer is proximate to, but not flush with the first end of the reference layer.

27. The asymmetric magnetic memory of claim 18, further comprising:

a plurality of parallel electrically conductive rows; and

a plurality of parallel electrically conductive columns transverse to the rows, the columns and rows thereby forming a cross point array with a plurality of intersections;

wherein each memory cell is located at an intersection between a row and a column.

28. The asymmetric magnetic memory of claim 18, wherein the reference layer is characterized by a pinned orientation of magnetization.

29. The asymmetric magnetic memory of claim 18, wherein the reference layer is a soft reference layer, the layer having a non-pinned orientation of magnetization.

30. The asymmetric magnetic memory of claim 18, wherein the intermediate layer is a tunnel layer.

31. The asymmetric magnetic memory of claim 30, wherein the tunnel layer is a dielectric material.

32. An asymmetrically patterned magnetic memory storage device comprising:

a plurality of parallel electrically conductive rows;

a plurality of parallel electrically conductive columns transverse to the rows, the columns and rows thereby forming a cross point array with a plurality of intersections;

a plurality of magnetic memory cells, each memory cell located at an intersection between a row and column, each cell characterized by:

at least one ferromagnetic data layer of a first size having a first end, a second end and a length along a longitudinal axis therebetween, and further characterized by an alterable orientation of magnetization along the longitudinal axis, the alterable magnetization having a North pole and a South pole aligning to each end of the data layer;

an intermediate layer in contact with the data layer; and

a ferromagnetic reference layer of a second size in contact with the intermediate layer, opposite from and asymmetric to the data layer, the reference layer having a first end, a second end, and a length along a longitudinal axis therebetween, and further characterized by a reference magnetic field along the longitudinal axis, the reference magnetic field having a North pole and a South pole aligning to each end of the reference layer.

33. The asymmetric magnetic memory of claim 32, wherein the interaction between the poles of the data layer and the poles of the reference layer may be characterized as one-end involvement.

34. The asymmetric magnetic memory of claim 32, wherein the magnetic field of the data layer is substantially symmetric about the longitudinal axis.

35. The asymmetric magnetic memory of claim 33, wherein the data layer is a substantially planar parallelogram with right angles.

36. The asymmetric magnetic memory of claim 32, wherein the data layer is smaller than the reference layer.

37. The asymmetric magnetic memory of claim 36, wherein the first end of the data layer is substantially vertically aligned with the first end of the reference layer.

38. A computer system comprising:

a main board;

at least one central processing unit (CPU) coupled to the main board; and

at least one memory store joined to the CPU by the main board, the memory store having a plurality of memory cells, each memory cell including;

at least one ferromagnetic data layer of a first size having a first end, a second end and a length along a longitudinal axis therebetween, and further characterized by an alterable orientation of magnetization along the longitudinal axis;

an intermediate layer in contact with the data layer; and

a ferromagnetic reference layer of a second size in contact with the intermediate layer, opposite from and asymmetric to the data layer, the reference layer having a first end, a second end, and a length along a longitudinal axis therebetween, and further characterized by a reference magnetic field along orientation of magnetization along the longitudinal axis.

39. The computer system of claim 38, wherein the interaction between the poles of the data layer and the poles of the reference layer may be characterized as one-end involvement.

40. The computer system of claim 38, wherein the magnetic field of the data layer is substantially symmetric about the longitudinal axis.

41. The computer system of claim 39, wherein the data layer is a substantially planar parallelogram with right angles.

42. The computer system of claim 38, wherein the data layer is smaller than the reference layer.

43. The computer system of claim 42, wherein the first end of the data layer is substantially vertically aligned with the first end of the reference layer.